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FOREST DISEASE CONTROL IN CALIFORNIA

JULY 1, 1966 to JUNE 30, 1967

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SEPTEMBER 1967

The Forest Service in California plays several roles in the control of forest tree diseases: it conducts detection and suppression operations on all National Forests in the State; it assists other Federal Agencies, chiefly the National Park Service, in their disease control programs; and it cooperates with the State of California and private landowners in disease control work on non-Federal lands. In addition, the Forest Service provides leadership in disease control for all forest land managers in California. The following report is a product of the latter responsibility, providing foresters and forest land managers a summary of current developments in the disease control programs presently active in California, principally blister rust control and dwarfmistletoe control.

Although the statistics in the tables apply to the fiscal year just completed, some sections deal largely with events of the present field season.

BLISTER RUST CONTROL

The status of control projects and the accomplishments for Fiscal Year 1967 are given in Tables 1, 2, and 3. Note that the deferment of ribes eradication on the Eldorado and Stanislaus National Forests, reported in 1966, is fully reflected here for the first time.

BRC PROGRAM REVIEWED

From the beginning, the blister rust control program in California has been revised continuously as changing conditions required. During the past 10 years, as it has become increasingly apparent that the disease in much of California would not follow the same spread and intensification pattern that it has elsewhere, ribes suppression gradually has been deferred in the Central Sierra Nevada and in the Coast Range. The successive changes were: initial ribes eradication deferred south of the Kings River (1958), all ribes eradication deferred south of the Merced River (1960), ribes eradication deferred on the Mendocino National Forest (1963), and ribes eradication deferred on the Eldorado and Stanislaus National Forests (1965).

Early in 1967, the Division of Timber Management began a comprehensive review of the blister rust control program in California. Following is a brief progress report of that program review, which is still in progress.

The program review has four broad objectives.

1. To determine the present status of the disease throughout the State, and to determine where control efforts can be relaxed further.
2. To develop guidelines for blister rust control and sugar pine management in areas where the disease is present, but where ribes eradication is not needed.
3. To re-examine the economics of young-growth sugar pine management where ribes eradication is needed.
4. To review cooperative features of the program.

During the spring and summer of 1967, progress was made toward each of these objectives.

1. Status of the Disease. A two-day work conference was held in Berkeley; participants represented the Pacific Southwest Forest and Range Experiment Station, the National Park Service, the California Division of Forestry, most of the National Forests involved, and the California Region. During the meeting, the status of the disease was examined closely and with general agreement as to the overall situation. However, it was abundantly clear that current information for particular areas often was far too limited to justify revising present blister rust control or white pine management policies. Indeed, there was unanimous agreement on the need for a continuing, Statewide detection program, the initial survey of which would provide the information needed for reviewing those policies.

Accordingly, the California Region developed and is coordinating such a detection program: a handbook of instructions was prepared; a two-day training meeting for the affected National Forests and Parks was held; procedures were field tested; and the Division of Timber Management assisted individual Forests and Parks in getting the initial detection survey underway. Preliminary results of those surveys are reported in a later section.

2. Guidelines. Although no ribes eradication or sugar pine management policies for the National Forests have yet been revised, the direction in which the revision may take place was outlined tentatively.
3. Economics. The economic basis of young-growth sugar pine management was reviewed in the light of recent developments in blister rust control and silviculture. A preliminary review of the main elements of the problem was prepared, and exploratory discussions with the Pacific Southwest Forest and Range Experiment Station were begun.
4. Cooperative Projects. Preliminary discussions were held with the California Division of Forestry officials regarding memoranda of agreement for ribes eradication work on private lands.

The status of the disease, tentative sugar pine management and ribes eradication guidelines, and the scope of the detection program are summarized in the following section.

BLISTER RUST CONTROL ZONES

As a convenience in developing blister rust control and sugar pine management guidelines, five BRC Zones have been established in northern California. The Zones shown in Figure 1 are tentative, and will be revised as needed. To be useful, such zoning must be quite broad, and some compromises were unavoidable. Naturally, the descriptions and recommendations apply only to the forested areas that support white pines.

BRC DETECTION SURVEYS

Blister rust detection surveys are not new. Scouting, as it is called, has been an important part of control operations for many years, and the procedures used in the past are still employed. However, recent developments in the control program--mainly the shift in emphasis from prevention to detection and local suppression--require more intensive scouting, greater standardization, and more coordination than was formerly needed.

Detection surveys are made principally to locate previously undiscovered infection centers (infected pines), and to gather information about rust spread and intensification within broadly-delimited forest areas, called BRC Detection Units. Detection Units, which cover most of the white pine type on the Forests and Parks involved, include areas where ribes have not been eradicated as well as sugar pine management areas where they have; private lands are included as well as State and Federal lands.

Within the detection units, which may be 100,000 acres in size or larger, both sides of most flowing streams are searched for infected pines and ribes. When an infection center is found, the boundaries are mapped; the age of the center is determined from the oldest canker present; the intensity of infection is determined from the proportion of white pine bearing cankers; and the status of the center is determined from the relative number of recent and old cankers.

A more complete explanation of the detection program is given in the handbook, "Blister Rust Detection Surveys in California, A Training Aid for the Surveyman," available from the Division of Timber Management in San Francisco.

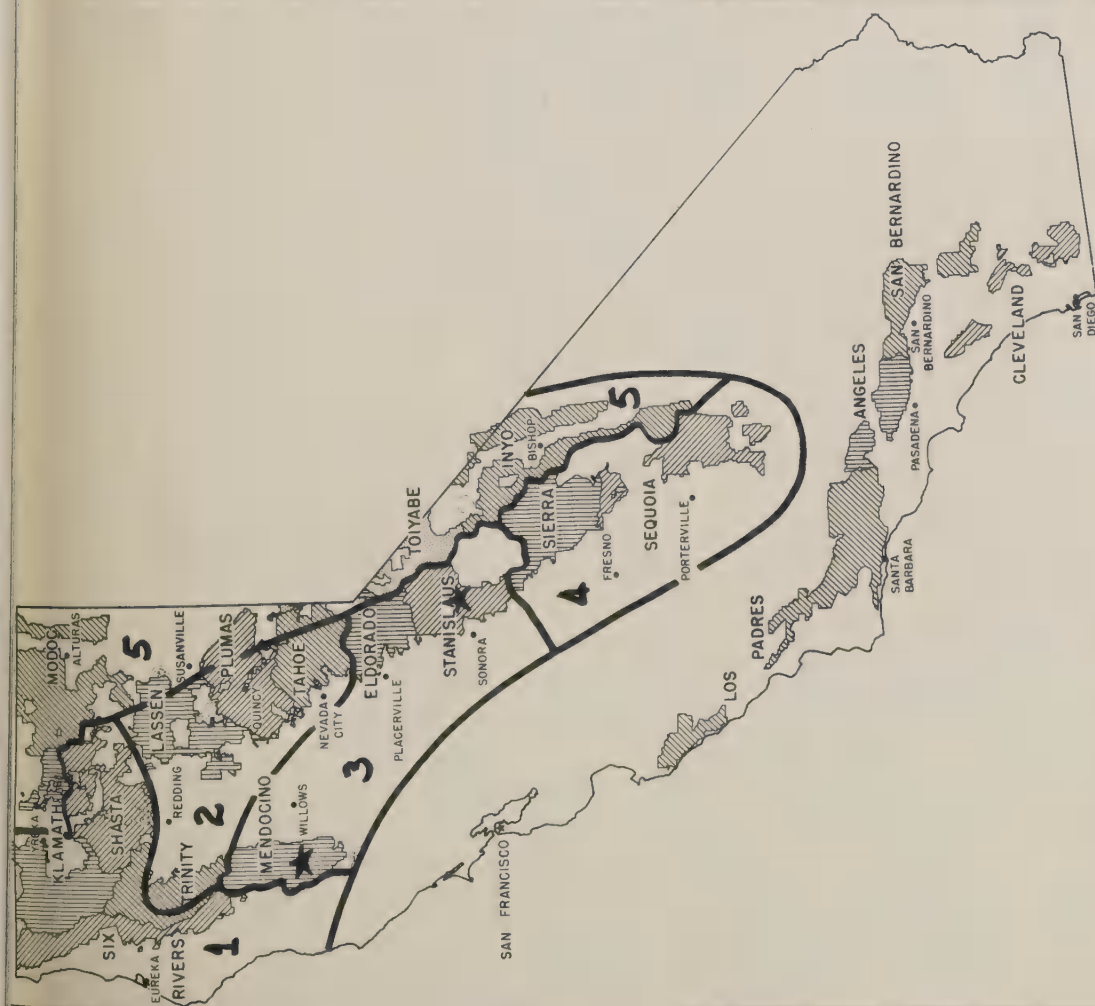


FIGURE 1. - BLISTER RUST CONTROL ZONES IN CALIFORNIA (TENTATIVE)

ZONE 1

Blister Rust: Widespread and severely damaging in much of zone.

Ribes: Eradication to close standards needed in all units.

Sugar Pine: Sugar pine authorized ^{1/} only in presently established sugar pine management units; no new units planned; sugar pine not commercially important in most of the Zone.

Detection Surveys: None needed, except damage surveys in management units.

ZONE 2

Blister Rust: Ranges from severely damaging to nearly absent. Occurrence more closely associated with drainage patterns than in Zone 1.

Ribes: Eradication needed in most management units; relaxed standards may be possible at some locations, depending on initial detection survey.

Sugar Pine: Presently authorized mainly in sugar pine management units. May be authorized for more general use, depending on initial detection survey.

Detection Surveys: Initial survey of entire white pine type needed.

ZONE 3

Blister Rust: Mainly rust-free; rust confined to local centers; no known centers in Yosemite Park.

Ribes: Except in Yosemite Park, all eradication deferred.

Sugar Pine: Except for known infection centers and high-hazard areas, no restrictions on the use of sugar pine because of blister rust.

Detection Surveys: Continuing surveys needed for entire pine type.

ZONE 4

Blister Rust: Entirely rust-free; blister rust never found on pines or ribes.

Ribes: All eradication deferred.

Sugar Pine: No restrictions because of blister rust.

Detection Surveys: Surveys by Forests and Parks not needed. Division of Timber Management will continue extensive surveillance.

ZONE 5

All areas where white pines are of importance are rust-free; little rust elsewhere. Zone does not figure greatly regarding blister rust control.

^{1/} Authorized, here and elsewhere, refers to National Forests and to sugar pine for planting or for crop trees, although the guidelines are recommended to other land managers and for other white pines.

Estimated detection accomplishments for the 1967 field season and the preliminary results of the surveys are summarized in Figure 2. Highlighting the season were the discovery of new infection centers on the Stanislaus, which extend the southern limit of the disease on pines a few miles; a small number of recent, post-eradication cankers in the Klamath Beaver Creek Sugar Pine Management Unit, indicating successful control of the disease by ribes suppression; and the intensive survey of all white pine type in Lassen Park.

The latter surveys, which covered about 13,000 acres of high-hazard stream type along 161 miles of streams, revealed that nearly all of the Park is rust-free, even though ribes have been eradicated only from selected control units. Virtually all of the infected trees (about 200) were outside control units in the Warner Valley area where rust has been found in the past.

FIGURE 2. - BRC DETECTION SURVEYS
ESTIMATED ACCOMPLISHMENTS FOR 1967 FIELD SEASON ^{1/}

UNIT	TYPE OF SURVEY	ACRES SURVEYED (Gross Area Covered)	SURVEY RESULTS (Preliminary)
Eldorado	Complete scouting and mapping north of Rubicon River.	40,000	Several new ^{2/} centers found outside control units; the largest was 50 acres.
Klamath	Strip sample of entire Beaver Creek sugar pine management unit.	5,000	Few post eradication cankers found.
Lassen	Complete scouting and mapping of Lyonsville and Digger Creek Detection Units.	65,000	Several new centers found; all were small; most outside of control units.
Lassen Park	Complete scouting and mapping of all white pine type in the Park.	52,000	Recent-origin cankers found in three centers: on Juniper Creek (100 acres, 137 trees); on Kings Creek (100 acres, 20 trees); on Warner Creek (5 acres, 3 trees). All are near the southeast boundary of the Park. Rust previously had been found on Kings Creek, other centers are new. All outside control units except Warner Creek, where all cankers were pre-eradication. Thirty-six infected trees found on 20 acres in Terminal Geyser area where rust previously had been found.
Plumas	Scouting on Greenville District.	60,000	Several new centers in the Rush Creek drainage and elsewhere; some may be large; most were outside control units.
Stanislaus	Complete scouting of Mi-Wok and Summit Districts. (Calaveras District scouted in 1966.)	50,000	Two new centers (about 300 acres, several hundred trees), possibly 1944-origin, found along Hull Creek south of Dodge Ridge, extending southern limit of rust on pine a few miles. A third center, similar to others, but much smaller found along Trout Creek to north and east. None of the centers studied closely yet.
Tahoe	Extensive surveillance.	-	A few new centers found.
Yosemite Park	Scouting in the north-west portion.	5,000	No blister rust found on pines or ribes.
TOTAL ALL SURVEYS		277,000	All results are tentative.

^{1/} Field work not complete at reporting time; some results tentative or incomplete.

^{2/} Previously undiscovered.

DWARFMISTLETOE CONTROL

Dwarfmistletoe control projects were carried out on most of the National Forests in the Region. As in the past, the control work financed with insect and disease control funds (and reported here in Table 4), consisted largely of survey and evaluation, since most of the suppression on timber lands is performed in conjunction with timber sale and stand improvement operations. However, most of the suppression work on recreation lands was financed with I&DC funds. A sizable acreage of rework is reported for the first time.

TRAINING SCHOOLS

Three field work conferences in dwarfmistletoe control were conducted by the Division of Timber Management in cooperation with the Division of Recreation Management. They were attended by foresters from all of the National Forests and Parks in the State and by representatives of the California Division of Forestry. Each was a 3-day meeting, covering practical aspects of dwarfmistletoe detection, evaluation, and suppression both on timber and recreation lands. Throughout the meetings the theme of multiple-treatment silviculture was stressed with specialists in disease control, silviculture and recreation management repeatedly showing the need for full silvicultural treatment of the stand, and calling attention to the importance of good planning. About 70 people attended the meeting.

NATIONAL PARK SERVICE

Suppression work continued in the Cedar Grove area of Kings Canyon National Park, where the first National Park Service control operation in California has been in progress for several years. The Park reports a thoroughly successful high pruning project that was carried out by a team of specialists from Yosemite at an average cost of about \$10.00 per tree. Work was done both in developed sites and in areas scheduled for later development.

CHEMICAL CONTROL

The California Region has been testing herbicides for the control of dwarfmistletoe on ponderosa and Jeffrey pine since 1962. At present there are two active series of tests.

1962 Tests. The first series, begun in 1962, is a secondary screening of three herbicides (2,4-DA, 2,4-DP, and 4-CPA), which were

previously tested by Clarence Quick at the Pacific Southwest Forest and Range Experiment Station. Each herbicide was applied at three concentrations (0.1%, 0.2%, 0.3% in stove oil), and at seven times during the period from May 2 to October 16. Each test consisted of 10-15 selected dwarfmistletoe plants that were treated with one herbicide at one concentration and at one time of year. Each dwarfmistletoe plant was on the bole of a separate tree; in all, 711 trees and plants were treated. Results after five growing seasons are summarized below and in Figure 3.

1. All herbicides at all concentrations killed some trees, and often a prohibitive number. However, all were far less damaging during the dormant period. (Some test trees were severely infected, and perhaps were more susceptible to the herbicides than trees to be treated in operational control work would be.)
2. Considering only trees that were not killed, all herbicides at all concentrations suppressed shoot production for five years on some, and often on most of the dwarfmistletoe plants treated.
3. According to present results, 2,4-DP is the most promising of the three herbicides. In general, 4-CPA was less damaging than 2,4-DP, but also less effective. At the two higher concentrations, 2,4-DA was much more damaging than 2,4-DP.
4. Except for 2,4-DA, there were not great differences between the low and the high concentrations.

Although further development work is needed, it seems likely that an operational chemical-control procedure employing these herbicides can be developed. Such a procedure will include the following features: direct treatment only, restrictive limits as to how severely infected the tree may be, treatment restricted to the late summer and winter.

Test results will be analyzed early in 1968 and reported more formally at that time.

1966 Tests. The second series of tests, begun in 1966, is a secondary screening of two additional herbicides; 2,4,5-TB applied directly to the dwarfmistletoe in an oil spray, and 2,4,5-TP applied indirectly in an oil-water emulsion and requiring translocation. Both herbicides were applied at two concentrations, at two growth periods (dormant and prior to the spring growth surge), at two locations (Klamath and San Bernardino National Forests); and on two host species (ponderosa pine on the Klamath, and Jeffrey pine on the San Bernardino).

A repeat test of 2,4-DA was included to tie the two series of tests together. Each test consisted of 20 dwarfmistletoe plants on 20 separate trees; in all, 640 trees were treated, including controls. Test trees were more comparable to trees that would be treated operationally than were those in the 1962 series.

Preliminary first-year readings on the Klamath plot revealed the following:

1. Shoots were killed on all dwarfmistletoe plants treated directly.
2. Few if any shoots were killed on dwarfmistletoe plants treated indirectly.
3. Very few trees were killed or damaged by treatment; all killed trees were small.

An informal examination of the San Bernardino plots indicate that first-year results there will be similar.

Figure 3. - Chemical Control of Dwarfmistletoe, 1962 Series,
Test Results in 1967, 2,4-DP, All Concentrations

Treatment Date 1	Trees Treated 2	Trees Killed 3	Dwarfmistletoe Plants Treated 4	Dwarfmistletoe Plants Suppressed 5
5/2/63	30	33%	20	95%
7/3/62	30	27%	22	91%
7/11/62	30	43%	17	94%
7/24/62	45	36%	29	100%
8/2/62	36	36%	23	91%
8/23/62	36	17%	30	90%
10/16/62	30	17%	25	64%

Col. 2: Total number of trees and dwarfmistletoe plants treated;
one treated plant in each tree.

Col. 3: Includes some trees in which only the top was killed.

Col. 4: Does not include plants on killed trees.

Col. 5: No visible shoots since treatment; column 4 is base for
percentage.

TABLE 1

STATUS OF RIBES ERADICATION IN CALIFORNIA AS OF JUNE 30, 1967

A. ACTIVE RIBES ERADICATION PROJECTS

LINE	LAND STATUS	CONTROL PROJECT	CONTROL AREA ACRES	WORKED INITIALLY		PREMAINTENANCE WORK REMAINING		MAINTENANCE	
				ACRES	PERCENT	ACRES INITIAL WORK	ACRES REWORK	ACRES	PERCENT
	A	B	C	D	E	F	G	H	I
1	PRIVATE	Klamath (Siskiyou County)	2,300	2,300	100	-	-	2,300	100
2		Shasta-Trinity (Siskiyou and Shasta Counties)	4,321	4,321	100	-	4,100	221	5
3		CDF (Whitehorse Unit) (Siskiyou and Modoc Counties)	7,902	7,802	99	100	6,464	1,338	17
4		Lassen (Tehama, Butte, Plumas, and Shasta Counties)	66,755	66,271	99	484	28,291	37,980	57
5		Plumas (Plumas, Butte, Yuba, and Sierra Counties)	22,668	21,621	95	1,107	21,191	430	2
6		Tahoe (Sierra, Nevada, and Placer Counties)	1,678	1,626	97	52	805	821	49
7		TOTAL PRIVATE LAND	105,624	103,941	98	1,683	60,851	43,090	41
8	STATE	Latour State Forest	2,865	2,794	97	71	1,062	1,732	60
9	NATIONAL FOREST	Klamath	2,238	2,238	100	-	-	2,238	100
10		Shasta-Trinity	13,696	13,116	96	580	11,906	1,210	9
11		Lassen	36,171	25,979	71	10,192	17,513	8,466	23
12		Plumas	74,530	66,281	89	8,249	56,819	9,462	13
13		Tahoe	24,585	21,739	88	2,846	13,368	8,371	34
14		TOTAL NATIONAL FOREST	151,220	129,353	86	21,867	99,606	29,747	20
15	NATIONAL PARK	Lassen Volcanic	27,313	24,951	91	2,362	1,231	23,720	87
16		Yosemite	83,952	81,665	97	2,287	6,051	75,614	90
17		TOTAL NATIONAL PARK	111,265	106,616	96	4,649	7,282	99,334	89
18	TOTAL ACTIVE CONTROL PROJECTS		370,974	342,704	92	28,270	168,801	173,903	47

B. SUMMARY OF RIBES ERADICATION PROJECTS IN CALIFORNIA

LINE	CONTROL PROJECT	ACRES OF CONTROL UNITS BY LAND STATUS				
		PRIVATE	STATE	NATIONAL FOREST	NATIONAL PARK	GRAND TOTAL
19	RIBES ERADICATION DEFERRED	Eldorado	-	37,940	-	60,726
20		Mendocino	-	8,521	-	8,521
21		Stanislaus	-	43,965	-	52,077
22		Sierra	-	49,578	-	64,000
23		Sequoia	-	4,974	-	4,974
24		Blodgett Exp. Forest-U.C.	940	-	-	940
25		D. I. Bliss-Emerald Bay State Parks	2,280	-	-	2,280
26		Calaveras Big Trees State Park	5,073	-	-	5,073
27		Mountain Home State Forest	878	-	-	878
28		Sequoia and Kings Canyon National Parks	-	-	50,576	50,576
29		TOTAL DEFERRED PROJECTS	45,320	9,171	144,978	250,045
30	TOTAL ACTIVE PROJECTS		105,624	2,865	151,220	370,974
31	TOTAL ACRES ALL CONTROL UNITS		150,941	12,036	296,198	621,019

TABLE 2
FISCAL YEAR 1967 ACCOMPLISHMENTS IN THE RIBES ERADICATION PROGRAM IN CALIFORNIA

LINE	LAND STATUS	CONTROL PROJECT	PREMAINTENANCE						MAINTENANCE		
			ACRES SURVEYED	ACRES INITIAL WORK	ACRES REWORKED	TOTAL ACRES WORKED	THOUSANDS OF RIBES DESTROYED	TO MAIN. ACRES	ACRES SURVEYED	ACRES WORKED	THOUSANDS OF RIBES DESTROYED
	A	B	C	D	E	F	G	H	I	J	K
1	PRIVATE	Klamath (Siskiyou County)	-	-	-	-	-	-	-	200	2
2		Shasta-Trinity (Siskiyou and Shasta Counties)	-	-	218	218	2	-	-	-	-
3		CDF (Whitehorse Unit) (Siskiyou and Modoc Counties)	1,119	-	319	319	16	421	-	-	-
4		Lassen (Tehama, Butte, Plumas, and Shasta Counties)	10,577	295	1,485	1,780	123	1,763	6,270	578	20
5		Plumas (Plumas, Butte, Yuba, and Sierra Counties)	6,098	519	1,658	2,177	250	110	-	-	-
6		Tahoe (Sierra, Nevada, and Placer Counties)	-	-	-	-	-	359	-	-	-
7		TOTAL PRIVATE LAND	17,794	814	3,680	4,494	391	2,653	6,270	778	22
8	STATE	Latour State Forest	-	-	-	-	-	-	-	-	-
9	NATIONAL FOREST	Klamath	-	-	-	-	-	-	-	-	-
10		Shasta-Trinity	892	34	438	472	16	-	-	-	-
11		Lassen	11,741	585	748	1,333	88	- 578	1,230	109	14
12		Plumas	12,658	990	3,666	4,656	717	430	-	-	-
13		Tahoe	3,170	546	1,624	2,170	191	199	2,526	372	21
14		TOTAL NATIONAL FOREST	28,461	2,155	6,476	8,631	1,012	51	3,756	481	35
15	NATIONAL PARK	Lassen Volcanic	35,920	-	-	-	-	-	-	-	-
16		Yosemite	138	-	41	41	20	-	162	102	15
17		TOTAL NATIONAL PARK	36,058	-	41	41	20	-	162	102	15
18	TOTAL WORK ACCOMPLISHED		82,313	2,969	10,197	13,166	1,423	2,704	10,188	1,361	72

TABLE 3
SUMMARY OF CONTRACT COSTS
July 1, 1966 to June 30, 1967

UNIT	RIBES SURVEY		SUGAR PINE DELINEATION		DWARFMISTLETOE SURVEYS		RIBES ERADICATION		DWARFMISTLETOE SUPPRESSION	
	Miles	Cost Per Mile	Miles	Cost Per Mile	Miles	Cost Per Mile	Acres	Cost Per Acre	Acres	Cost Per Acre
Cleveland	-	\$ -	-	\$ -	-	\$ -	-	\$ -	13	\$100.00 ^{1/}
Lassen	176	24.57	233	24.25	82	20.96	3,082	7.30	-	-
Plumas	47	30.53	-	-	78	33.03	5,463	10.00	57	51.18
Shasta-Trinity	-	-	-	-	-	-	1,906	6.87	-	-
Tahoe	172	38.38	-	-	-	-	2,113	7.72	-	-
Kings Canyon National Park	-	-	-	-	-	-	-	-	109	137.00 ^{1/}
TOTAL	395	\$ 31.29	233	\$ 24.25	160	\$ 26.84	12,564	\$ 8.48	179	\$106.98

^{1/} See work in developed recreation sites; includes post-suppression cleanup.

Cost per mile includes associated control lines, but miles includes only survey strips. Payments to contractors only.

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TABLE 4
DWARFMISTLETOE CONTROL IN CALIFORNIA
July 1, 1966 to June 30, 1967

UNIT	ACRES EVALUATION		ACRES INITIAL SUPPRESSION ^{1/}		ACRES REWORK	
	Developed Recreation Sites	Other Forest Land	Developed Recreation Sites	Other Forest Land	Developed Recreation Sites	Other Forest Land
Angeles	81	-	14	-	-	-
Cleveland	10	300	1	2	-	-
Eldorado	-	1,000	-	25	-	-
Klamath	20	2,560	-	375	20	-
Lassen	-	9,080	-	-	-	47
Los Padres	100	-	9	17	32	56
Mendocino	-	13,550	-	-	-	-
Modoc	-	7,240	-	-	-	-
Plumas	-	10,700	-	115	-	197
San Bernardino	230	820	-	-	21	18
Sequoia	17	50	17	-	-	-
Shasta-Trinity	-	3,500	-	-	-	-
Sierra	-	260	-	80	-	-
Stanislaus	-	20,060	-	20	-	-
Total National Forests	458	69,120	41	634	73	318
Kings Canyon National Park	-	-	20	26	63	-

^{1/} Pest control projects only; additional suppression done in conjunction with other timber and recreation projects.

